UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte TAKESHI HOSHIDA, HIROSHI ONAKA,
and TAKAFUMI TERAHARA

Appeal 2007-2626
Application 09/853,323
Technology Center 2600

Decided: November 8, 2007

Before KENNETH W. HAIRSTON, ROBERT E. NAPPI, and KARL D. EASTHOM, *Administrative Patent Judges*.

EASTHOM, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellants appeal under 35 U.S.C. § 134 from a final rejection of claims 1 to 26. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

THE INVENTION

Appellants claim a method for amplifying the power of an optical signal on an optical link. The optical signals traveling on the link are amplified by the creation of a lower wavelength pump light, created by Raman pump sources, traveling in the same link (Specification 2: 25-33, 11:15-19). The pump light travels either in the same or the opposite direction and at substantially the same speed as the optical signal (Specification 2: 29-30, 11: 23-27). The optical signal comprises a carrier wave modulated with a non-intensity modulation data signal such as a phase and/or a frequency modulation signal (Specification 4: 29-31). In addition to the Raman pump, the signal can be further amplified in a separate discrete amplifier (Specification 21: 5-13).

Claims 1, 2, 11, and 12 are representative of the claims on appeal, and read as follows:

1. A method for transmitting information in an optical communication system, comprising:

modulating a non-intensity characteristic of an optical carrier signal with a data signal to generate an optical information signal;

transmitting the optical information signal over an optical link; and

amplifying the optical information signal over a length of the optical link with a co-launched amplification signal traveling in a same direction as the optical information signal in the optical link.

2. The method of Claim 1, wherein the co-launched amplification signal travels at a substantially same speed as the optical information signal.

11. The method of Claim 1, further amplifying the signal in the optical link with a discrete amplifier.

12. The method of Claim 1, wherein the discrete amplifying[1] comprises an erbium-doped fiber amplifier (EDFA).

THE REJECTION

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

Kitajima	US 5,515,196	May 7, 1996
Bergano	US 6,310,709 B1	Oct. 30, 2001
Du	US 6,417,958 B1	Jul. 9, 2002
Ohya	US 6,556,327 B1	Apr. 29, 2003

The Examiner rejected claims 1-6, 8-9, 11-18, 20-21, 23-24, and 26 under 35 U.S.C. § 103(a) based upon the teachings of Kitajima and Du.

The Examiner rejected claims 1-5, 7-9, 11-17, 19-21, 23, and 25-26 under 35 U.S.C. § 103(a) based upon the teachings of Bergano and Du.

The Examiner rejected claims 7, 10, 19, 22, and 25 under 35 U.S.C. § 103(a) based upon the teachings of Kitajima, Du, and Ohya.

The Examiner rejected claims 6, 10, 18, 22, and 24 under 35 U.S.C. § 103(a) based upon the teachings of Bergano, Du, and Ohya.

ISSUES

There are six obviousness issues before us.

Issue 1 involves whether the Examiner erred in combining Kitajima and Du in rejecting claim 1[2].

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[1] The phrase "discrete amplifying" lacks antecedent basis. More importantly, how can a "discrete amplifying" comprise structure such as an amplifier?

[2] Claims 3-10, 13, and 15-26 stand or fall with claim 1.

Issue 2 involves whether the Examiner erred in combining Kitajima and Du to reject claim 2[3].

Issue 3 involves whether the Examiner erred in combining Kitajima and Du to reject claims 11 and 12[4].

Issue 4 is involves whether the Examiner erred in combining Bergano and Du to reject claim 1[5].

Issue 5 involves whether the Examiner erred in combining Bergano and Du to reject claim 2[6].

Issue 6 involves whether the Examiner erred in combining Bergano and Du to reject claim 11 and 12[7].

FINDINGS OF FACT (FF)

1. Appellants have not challenged the Examiner's findings that Kitajima. discloses, except for the specific type of amplifier that would create the claimed co-launched amplification signal, all of the claimed invention of claim 1, including an amplifier (Answer 11, 13; Reply Br. 2).

2. Appellants have not challenged the Examiner's findings that Du discloses employing a co-launched amplification signal using the same type of Raman amplifier as that disclosed by Appellants (Answer 11, 13-14, Reply Br. 2).

3. Du discloses that Raman co-launched amplification methods are compatible with virtually any wavelength division multiplexed (WDM)

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[3] Claim 14 stands or falls with claim 2.
[4] Claims 11 and 12 do not fall or stand together but involve related issues.
[5] Claims 3-10, 13, and 15-26 stand or fall with claim 1.
[6] Claim 14 stands or falls with claim 2.
[7] Claims 11 and 12 do not fall or stand together but involve related issues.

communication system, and teaches a solution to cross-talk problems in systems using intensity modulation (Du, col. 2, ll. 21-25, col. 3, ll. 30-64)[8].

4. Du discloses that Raman amplifiers are capable of both increasing the capacity of optical systems in terms of higher data rate and more channels and the transmission distance of the systems (Du, col. 1, ll. 13-18; col. 3, ll. 17-27).

5. Appellants admit that in the prior art, "[s]ignals may also be boosted in the fiber using Raman effect amplification. In the Raman effect, optical signals traveling in the fiber are amplified by the presence of a lower wavelength pump light traveling in the same fiber" (Specification 2: 25-30).

6. Kitajima employs intensity (2) and non-intensity (3) modulation together in one optical system as a solution to solving competing problems of chirping and Brillouin scattering (Kitajima Fig. 1; Fig. 14; col. 1, ll. 40-53; col. 2, ll. 53-67; col. 5, ll. 41-48).

7. The Examiner asserted that the Raman amplifier of Du operates in the same manner as that of Appellants so that substantially the same speeds are involved for all waves traveling on the optical medium (Answer 13: ll. 2-5; 13, l. 14 to 14: l. 16; Reply Br. 3).

8. Appellants disclose that in their system, a lower wavelength pump light is used. Appellants explain that eventually the pump signal obtains the same wavelength as the optical signals since the pump signal loses energy by scattering, and, therefore, eventually also travels at the same speed as the optical signal which thereby gains energy (Specification 11-12, ll. 23-14).

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[8] Appellants argue that Du does not disclose non-intensity modulation (App. Br. 14). We infer from this and the cited passages of Du that intensity modulation is disclosed in Du.

9. Du discloses that the wavelength of the pump in the Raman amplifier (1435nm) is less that that of the signal window (1525-1545nm) (Du, col. 7, ll. 30-38). The difference in wavelengths between the co-launched amplification signal (1435nm) and the optical signal is calculated here to be at most, about 7.1% (calculated from the ratio 110/1545).

10. Appellants admit that "[t]o transmit signals over long distances, optical networks typically include a number of discrete amplifiers spaced along each fiber route...to compensate for transmission losses in the fiber" (Specification 2, ll. 19-24).

11. Kitajima discloses at least two amplifiers 102 (col. 11, ll. 5-15; Figs. 11-12).

12. Du discloses "discrete Raman amplifiers" (col. 11, ll. 43-44).

13. Du discloses erbium-doped amplifiers 35 and 46 employed to ensure or adjust signal levels in a test system having a Raman amplifier (col. 7, ll. 25-60).

14. Phase modulator 108 modulates a non-intensity characteristic of an optical carrier signal having a data signal (Bergano Fig. 1, col. 2, ll. 37-41). Bergano discloses both intensity 102 and non-intensity (108) modulation (Fig. 1, col. 2, ll. 45-52; col. 5, ll. 25-49).

15. Bergano discloses that the phase of the data bits is varied (col. 3, ll. 41-45).

PRINCIPLES OF LAW

The Examiner bears the initial burden of presenting a prima facie case of obviousness. *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992). If that burden is met, then the burden shifts to the Appellants to overcome the prima facie case with argument and/or evidence. *Id.*

The Examiner's articulated reasoning in the rejection must possess a rational underpinning to support the legal conclusion of obviousness. *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006).

"[W]hen a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result." *KSR Int'l Co. v. Teleflex Inc.,* 127 S.Ct. 1727, 1739-40 (2007).

> For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill. *Sakraida* and *Anderson's-Black Rock* are illustrative – a court must ask whether the improvement is more than the predictable use of prior art elements according to their established functions.

Id. at 1740 .

> A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. The degree of teaching away will of course depend on the particular facts; in general, a reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant.

In re Gurley, 27 F.3d 551, 553 (Fed. Cir. 1994).

"A known or obvious composition does not become patentable simply because it has been described as somewhat inferior to some other product for the same use." *Id. at 553.*

When the claimed and prior art products are identical or substantially identical, the burden shifts to applicant to prove that the prior art products do

not necessarily or inherently possess the characteristics of the claimed product. *In re Best*, 562 F.2d 1252 (CCPA 1977); *In re King*, 801 F.2d 1324 (Fed. Cir. 1986); *In re Ludke*, 441 F.2d 660 (CCPA 1971); *In re Swinehart*, 439 F.2d 210 (CCPA 1971).

ANALYSIS

Issue 1

The issue is whether the Examiner erred in finding obviousness based on specific reasons for replacing the generic amplifier in the optical system of Kitajima with the specific Raman amplifier disclosed in the optical system of Du[9]. Appellants argue that because the secondary reference to Du discloses that Raman amplifiers increase cross-talk in intensity modulation methods, and because the primary reference to Kitajima discloses non-intensity modulation, that the Examiner improperly combined the references. Appellants reason that Du either teaches away from employing Raman amplifiers, or teaches using Raman amplifiers only in intensity modulation systems[10].

We disagree primarily because Kitajima does not disclose only the claimed non-intensity modulation scheme as implied by Appellants' argument. Rather, Kitajima discloses both the intensity modulation method

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[9] That is, there is no dispute over whether a Raman amplifier employs the claimed method of amplifying the optical information signal over a length of the optical link with a co-launched amplification signal traveling in a same direction as the optical information signal in the optical link. (See FF 1-2).
[10] We note at the outset that Hansen et al. (US 6, 323,993), cited by the Examiner, discloses employing Raman amplifiers with non-intensity modulation (Hansen col. 2, ll. 23-26, see col. 7, ll. 44-47, col. 9, ll. 41-52).

of Du and the non-intensity modulation method claimed, and discloses employing both in one optical system (FF6). Consequently, even if Du's teachings were limited to intensity modulation as argued by Appellants, because Kitajima discloses employing a similar intensity modulation scheme as part of an optical system, Du would have led one of skill to employ the solution to the cross-talk problems involved with the intensity modulation portion of the Kitajima system.

As noted by the Examiner, Du discloses several benefits that flow from employing a Raman amplifier, such as increased capacity in terms of data rate and distance, and compatibility with virtually any WDM system like that of Kitajima (see FF 3-4, Answer 11). Further, Appellants admit prior art use of Raman amplifiers to amplify optical signals (FF 5). Thus, Du and the prior art teaches both solutions and benefits for solving cross-talk problems that would also occur in the same or similar intensity modulation portion of the system of Kitajima. We also agree in general with the Examiner's reasoning that applying Du would not result in "destroying the functionality" of the Kitajima system (Answer 13: ll. 2-5). The system is preserved with the modification, and so are its disclosed beneficial aspects. Such original benefits preserved in the Kitajima system include reduced chirping and scattering (FF 6). Hence, following the analysis under *In re Gurley*, 27 F.3d 551 (Fed. Cir. 1994), we find that even if cross-talk is an "inferior" quality of a Raman amplifier, since Du teaches reducing the cross-talk in order to capture the increased capacity in data and distance flowing from the use of a Raman amplifier, and since the benefits of reduced scattering and chirping of the Kitajima system would be preserved, one

would not have been "led in a direction divergent from the path that was taken by the applicant." *Id.* at 553.

Further, following the analysis under *KSR*, we find that Appellants did no more than substitute a particular known element, the Raman amplifier of Du, to perform a known method, amplifying an optical information signal with a co-launched amplification signal traveling in the same direction as the optical information signal, in a similar device, the optical system of Kitajima. One of ordinary skill in the art would have recognized that the particular technique of Du would improve the similar system of Kitajima, given the teachings that Raman amplifiers are useful for a wide variety of WDM optical systems to increase the capacity in terms of higher data rate and transmission distance (FF 3, 4). Appellants have not rebutted the prima facie case by showing that "the improvement is more than the predictable use of prior art elements according to their established functions." *KSR,* 127 S. Ct. at 1740.

Issue 2

Appellants argue regarding claim 2 that the co-launched amplification signal of Du does not travel at substantially the same speed as the optical information signal. The Examiner counters that the Raman amplifier of Du operates in the same manner as Appellants' amplifier, so that substantially the same speeds are involved for all waves traveling on the optical waveguides. (FF 7). Appellants argue that it is the Examiner's burden to show that the speed limitation is inherent (Reply Br. 3).

Because we find that the Examiner has asserted that both Appellants and Du disclose employing the same or similar Raman amplifier sending co-

propagating waves in the same or substantially the same manner (FF 7); that accordingly, the burden shifts to Appellants to show that Du employs the Raman amplifier in a different or substantially different manner. *In re Best*, 562 F.2d 1252, 1252-56 (CCPA 1977) (appellant failed to rebut 35 U.S.C. § 102 or 103 prima facie case with data, even though prior art was silent as to cool down rate, where applicant claimed "cooling...at a rate sufficiently rapid that the cooled zeolite exhibits an X-ray powder diffraction pattern," the Examiner asserted that cooling occurred inherently to foster handling, and appellant's data did not show that normal cooling rates do not create the X-ray diffraction pattern). "Where, as here, the prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the PTO can require an applicant to prove that the prior art products do not necessarily or inherently posses the characteristics of [the] claimed product." *Id.* at 1255. *See also In re King*, 801 F.2d 1324 (Fed. Cir. 1986); *In re Ludke*, 441 F.2d 660, 664 (CCPA 1971)("since the only alleged distinction between claims 1-6 and Menget is recited in functional language, it was incumbent upon appellants, when challenged, to show that the canopy disclosed by Menget does not actually possess such characteristics").

The record supports the assertion that the prior art and Appellants' Raman amplifiers operate in the same manner sufficient to shift the burden to Appellants to prove otherwise. That is, Appellants admit that in prior art Raman amplifiers optical signals are amplified by the presence of a lower wavelength pump light traveling in the same fiber (FF 5). Appellants similarly explain that in their disclosed system, a lower wavelength pump light is used (FF 8). Appellants further explain that eventually the pump

signal obtains the same wavelength as the optical signals, since the pump signal loses energy by scattering, and therefore eventually also travels at the same speed as, and transfers energy to, the amplified optical signal (FF 8).

Similarly, Du also discloses that the wavelength of the pump (1435nm) is less than that of the signal window (1525-1545nm) (FF 9). Thus, in Du, the difference in wavelengths between the co-launched amplification signal and the co-propagating optical signal is at most, about 7.1% (FF 9). The above facts sufficiently bolster the inferences that both the prior art and Appellants employ a Raman amplifier in which the waves co-propagate, and that Appellants do no more than operate the Raman amplifier as it is substantially operated in the prior art. We infer that because all prior art Raman amplifiers must necessarily operate under the same principal in order to have a wave co-propagating with and amplifying the other wave, or operate sufficiently similarly to meet the claimed limitation of "substantially" the same speed. As indicated *supra*, the burden shifted to Appellants to explain any difference. *In re Best* at 1255; *In re Ludke* at 664.

We have also carefully considered Appellants' assertion that the Raman amplifier of Du is distinct from the disclosed Raman amplifier. We find that this is not evidence, but an ineffective argument, since no reasons are given, nor is any comparison made with the prior art. *In re Best* at 1254. We note also Appellants' assertion that different wavelength waves travel at different speeds, and like the Examiner accept that as correct (Answer 14: ll. 5-16, Reply Br. 3). However, we find that because the Du wavelengths differ by only 7.1% (FF 9), the Examiner's assertion that the waves would travel at "substantially" the same speed as claimed is supported since the waves in Raman amplifiers co-propagate to transfer energy for

amplification, sufficient to shift the burden to Appellants to explain how their Raman amplifier operates in a manner different or substantially different than that of Du.

Issue 3

The issue regarding claims 11-12 is whether the Examiner erred in finding obviousness based on the added elements of a further discrete amplifier (claim 11) and the erbium-doped fiber amplifier (claim 12) in the system of Kitajima. We find that the Examiner did not err.

Appellants admit that "[t]o transmit signals over long distances, optical networks typically include a number of discrete amplifiers spaced along each fiber route...to compensate for transmission losses in the fiber (FF 10). We note further that Kitajima discloses at least two amplifiers 102 (FF 11), and Du discloses "discrete Raman amplifiers" (FF 12). We conclude, applying the legal framework of *KSR* to these facts, that Appellants have shown no more than a predictable result flowing from the combination of familiar elements according to known methods of a known prior art element; that is, employing more amplifiers boosts signals over a longer distance than would otherwise occur without extra amplifiers. *KSR*, 127 S.Ct. at 1739 ("The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.").

As to claim 12, we agree with the Examiner that the combination of Du and Kitajima meets the limitation[11] (Answer 15). Appellants argue there

[11] We note that claim 1 does not recite "discrete amplifying" but claim 12, depending therefrom, implies that it does.

is no motivation to use both types of amplifiers. We interpret the argument to mean an erbium-doped fiber amplifier and some other amplifier. However, claim 12 does not specifically require two amplifiers, see n. 11. If two amplifiers are implicit, we hereby apply similar reasoning as applied above for claim 11, and agree in general with the Examiner that a known reason to combine the elements is to amplify the signal. We further note that Du discloses erbium-doped amplifiers 35 and 46 at column 7, lines 25-60, employed to ensure or adjust signal levels in a test system having a Raman amplifier.

We conclude Appellants have shown no more than a predictable result by combining old elements with no change in their respective functions, that is, employing a specific amplifier ensures or is useful to adjust a certain output by further amplification. *Id.*

Issues 4-6

We will also affirm the Examiner as to issues 4-6. With respect to issue 4, the central argument is that Appellants argue that Bergano does not disclose modulating a non-intensity characteristic of an optical carrier signal with a data signal to generate an optical information signal (App. Br. 16-18). We disagree, and find that the phase modulator 108 modulates a non-intensity characteristic of an optical carrier signal having a data signal. In other words, under one alternative interpretation, the claim does not require modulating with a data signal, but instead, is interpreted to mean that modulating occurs on a carrier signal that has a data signal. That is, a carrier signal with a data signal is interpreted here to be the same as a carrier that has a data signal.

Under a second alternative interpretation, Bergano discloses that the phase of the data bits are varied (FF 15). Consequently, the carrier signal is phase modulated with the optical carrier signal, since the data signals ultimately modify the carrier signal.

We note that Bergano, like Kitajima, also discloses both intensity (102) and non-intensity (108) modulation (FF 14). The issues regarding Kitajima, therefore, apply to Bergano. Thus, our reasoning for finding that claim 1 would have been obvious based upon the teachings of Kitajima and Du applies in all respects to the combined teachings of Bergano and Du.

With respect to issues 5-6, we also reach a finding of obviousness based upon the same reasoning advanced *supra* for issues 2-3.

CONCLUSION OF LAW

The Examiner has established a prima facie case of obviousness for claims 1, 2, 11, and 12, which the Appellant has not overcome with argument and/or evidence. The obviousness of claims 3 to 10 and 13 to 26 has been established by the Examiner because Appellants have not presented any patentability arguments for these claims apart from the arguments presented for claims 1, 2, 11, and 12.

DECISION

The obviousness rejection of claims 1 to 26 is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

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